Laboratory diagnostics in infectology

Laboratory examinations

Specific

Microbiology and Immunology Labs

Nonspecific

Biochemistry and Hematology Labs

(FW, CRP, blood count+diff., urea, creatinin, liver tests, minerals etc.)

Patient

↓

Diferential diagnosis

Serology

4-fold increase in paired sera or diagnostic titer

Direct detection

microscopy

Ag or toxin detection, D(R)NA techniques (PCR)

Cultivation

microbe sensitivity testing

Collection & transport of samples

↓

CRITICALLY IMPORTANT!!

Legionela pneumophila – sputum? BAL?

C) urine for Ag detection

ALWAYS PRIOR ADMINISTRATION OF ATB THERAPY

SUFFICIENT AMOUNT OF MATERIAL

Ag detection

- Useful for rapid test results
- Easy to perform
- False negatives in immunocompromised patients (HAV outbreak)
- Stool rotavirus, nasal RSV, throat group A streptococcus

Ag detection

EIA (enzyme immunoassay)

- good sensitivity and specificity
- detection of bacteria incl. toxins, viruses, fungi and parasites

Latex aglutination - CSF (Strep. pneumoniae, Strep. group B, H. influenzae, N. meningitidis, Cryptococcus neoformans)

Molecular biology methods

PCR

- trained and skilled staff
- bacterial infections: N. meningitidis, M. tuberculosis, Strep. pneumoniae, Listeria monocytogenes
- viruses: HSV 1,2, CMV, enteroviry, EBV, parvovirus B19
- often false positive and negative results
- real-time PCR reduces disadvantages

Serology

- Acute testing may have poor sensitivity
- Convalescent testing difficult to interpret
- Acute AND convalescent testing is "gold standard" for many infections; 4-fold rise in antibody titer.
- Measure IgM and/or IgG
- Generally easy to perform

Non-specific tests

- FW, CRP – increased in bakterial infections, but also in many non-infectious diseases (AI, tumors)
  - slight increase in viral infections
  - appropriate for the management of therapy
- blood count – numbers of WBC, RBC, thrombocytes + Hb, Hct
  - lymphocytosis vs granulocytosis

Blood count in infectious diseases

leukocytes, erythrocytes, Hb, Hct, trombocytes

Differential

- lympho, mono, granulo

Changes in blood count are caused by:

- direct effect of pathogen
- underlying disease, chronicity
- drug effects

Blood count in infectious diseases – contd.

Neutrofilia

- bacterial infections

Eosinofilia

- infections due to parasites
- reactive during severe infections
- non-infectious cause

Blood count in infectious diseases – contd.

Lymphocytosis (>4000/microl)

reactive in virosis, TBC, lues, pertussis

Lymphocytopenia (<1500/microl)

therapy with steroids, TBC, HIV

Thrombocytosis

Kawasaki syndrom

Thrombocytopenia

malaria, drug-induced (trimetoprim), AI

Imunology examinations

- Ig concentrations

  higher incidence of the infections with encapsulated bacteria in hypogamaglobulinemia

  higher incidence GIT a resp. infections in IgA deficiency

- lymphocyte subsets (cellular immunity)

  HIV+ infection, sepsis etc.

- phagocyte function tests (macrophages, PMN)

  if impaired, then ↑ incidence Staph. aureus Strep. pyogenes, E. coli, Klebsiella sp. infections

Take-home message

Physician has to know:

- the principle of a test
- why is indicating a given test
- to interpret results

Sample collection prior antibiotics!